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"For the practicing professions concerned with mental retardation"

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Part III

Method For Measuring Educability

Helen Schueman

Perception in Organic Mental Defectives

Noel Jenkin
Noel West

The 3 I's NOT The 3 R's

Harold A. Delp

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Table of Contents

A Method for Measuring Educability in Severely Mentally Retarded Children: A Preliminary Study. Part III 2
Helen Schucman

Review 4

Perception in Organic Mental Defectives: An Exploratory Study I. The Size Weight Illusion 5
Noel Jenkin and Noel West

The 3 I's Not The 3 R's: A Philosophy for Teachers of Mentally Retarded 11
Harold A. Delp

Index: The Training School Bulletin, Volume 54 15

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1. Articles of a technical nature, e. g., reports of research, discussion of problems in the field.
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COVER: Careful training and teamwork produce excellent results at The Training School.

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COMMITTEES

None of us goes through our professional life unscathed by committee memberships. The growth of groups in all sorts of activities and the realization that a single mind is rarely capable of dealing satisfactorily with the complexities of modern organizations have made committees imperative.

Not one of us would see the world without them but each of us in time lives to decry them. Any student of professional endeavor must give some time to studying the committee method of meeting problems, its place in the scheme of accomplishing things, and the reactions of his own personality to being part of committees at various times in his life. For this is a most important tool in our existence today. When not called upon to join one, most of us are soon involved in forming one. If we can utilize committees effectively for our purposes, we have gone a long way toward seeing success in our professional endeavors and in receiving the personal satisfactions necessary to all of us from those successes.

Obviously some of our major difficulties arise from our propensities to use committees for every sort of problem. This can lead to stalling the engines of progress. It can also become the favorite of those who have learned to avoid making necessary decisions so that the responsibility for the decisions does not fall on them. For these persons the safety to them of muddying the actual responsibility for actions among the group is more to be desired than is the progress which might be made by standing up and openly making decisions so that work might advance. Hence, it may well be that decisions for action can be made more efficiently by individuals.

In the situations where deliberations lead to policy solutions we have a different story. Here the thoughts contributed by several people ordinarily should be better balanced to answer the problems than would be the decisions of the individual. Of course, the selection of the members of any group places limitations on the degree of satisfactory solutions attainable. A committee is no better than the combined talents of its members. Its structure allows the stream of thoughts to flow more easily but the screen which sifts the gold dust has a mesh the size of which is determined by the committee's membership.

Many younger workers seem to have been taught that authority and decisions by individuals is bad medicine. There are times when epsom salts are desirable, just as there are times when the more vague benefits of multiple vitamin tablets may build a better constitution over a period of time. Let us not let our biases cause us to use one or the other to excess.

CONFERENCE ON DIAGNOSIS

We are looking forward to our two-day conference on the problems of diagnosis in the field of mental retardation to be held at The Training School on May 19 and 20. The participants are top representatives of the many fields which are or should be concerned with this condition. The audience is selected to be people whose positions not only make them interested in the problems but enable them to do something about them when they return home.

Concise reports of the meeting, we hope, will make up the August or October editions of this Bulletin with complete stenographic reports of particular presentations available to those who wish to order them.

This will be one of the events celebrating the 70th Anniversary of The Training School this year.

W. J.

A Method for Measuring Educability in Severely Mentally Retarded Children: A Preliminary Study

HELEN SCHUCMAN

This is the last of three articles describing an experiment in the educability of severely mentally retarded children. Part I dealt with the purpose, procedures, and subjects. The results were presented and discussed in Part II*. The summary, conclusions, and implications are given in Part III.

PART III

Summary

The purpose of this experiment was to investigate the relations of posttraining learning gains and training transfers to educability in severely mentally retarded children. The basic hypothesis was that the educability of the severely mentally retarded child can be inferred from his response to learning situations designed to study abilities fundamental to all education; the ability to profit from instruction, and to transfer the training to other situations.

Criteria were set up to serve as guides in the construction and development of suitable tests. The criteria demanded that tests be appropriate to the abilities of the subjects and allow for their possible verbal and manipulative handicaps; that minimal dependence on past experience be involved; that materials appeal to the children and tests be short enough to hold their interest; and that procedures and materials be suited to the special problems of brain-injured subjects. Areas chosen for investigation were imitation, memory, and abilities to make gross shape, size, and color discriminations.

A trial battery was constructed, and a series of pilot studies was conducted to bring the tests into increasing accord with the criteria established for them. The final battery consisted of five tests, each administered three times. A training period intervened between the first and second administrations, which yielded a pre- and a posttraining score respectively. A different form of the test, or different procedures for administering the original form, was used for the third administration, which yielded a transfer score.

The battery was administered individually to 52 non-institutionalized subjects, who attended special schools for mentally retarded children in the New York metropolitan area. Their estimated IQs, based on whatever standard tests could be used, ranged from 12 to 52, mean 33.73. Ages ranged from 5-6 to 12-7, mean 8-10. The subjects had attended school from 1 to 37 months, mean 13 months. There were 35 males and 17 females. All were medically declared to suffer from physical conditions known to produce mental retardation. Twenty-nine were brain-injured.

A study of the results showed that posttraining and transfer performance, for the group, were significantly better than initial test performance, while, with one exception, transfer scores were significantly lower than posttraining scores. Analysis of the results also indicated that the tests had met the criteria established for them.

Various evidences of satisfactory reliability were found. Comparisons of scores obtained by matched pairs of subjects suggested satisfactory reliability for the battery as a whole, as well as for most of the separate administrations of the tests. These comparisons, based on matched rather than identical individuals, probably produced minimal reliability estimates. Comparisons between the same administrations of the different tests demonstrated a high degree of interest consistency for posttraining and transfer scores. A high intratest consistency for the different administrations of the same tests was also found.

Analysis of the scores showed that sex, presence or absence of brain-injury, time spent in school, and chronological age did not significantly affect performance on any administration of any test. However, intelligence (as measured by estimated IQs) was found to influence test performance to a highly significant extent.

It was further found that posttraining and transfer scores were more sensitive measures of differences in ability than was pretraining test performance. When subjects were divided into bright and dull groups on the basis of estimated IQs, posttraining and transfer performance distinguished significantly between the two groups on every test. In contrast, pretraining scores did so comparatively seldom. Also, while the bright group made significant learning gains and train-

* Parts I and II were published in the November '57 and February '58 issues of The Training School Bulletin respectively.

ing transfers in all cases, the dull group usually failed to do so.

Selection devices for individual subjects, based on their test scores, were set up. Subjects were then divided into a high, middle, and low group according to their test performance, and the intelligence levels of the groups, as measured by estimated IQs, were compared. It was found that the high group in test performance was always significantly superior in intelligence to the low and middle groups of test performers. Further, with one exception on pretraining scores, the lowest group in test performance was significantly lower in intelligence than the middle group of test performers.

Each administration of each test was correlated with Vineland SQs, estimated IQs, and teachers' ratings. The coefficients obtained for pretraining scores failed to reach significance in several cases, and were always lower than those obtained for posttraining and transfer scores. All coefficients obtained for posttraining and transfer performance were statistically significant, beyond the .001 level of confidence in 28 of the 30 comparisons.

Conclusions

Within the delimitations of the study, the following conclusions were drawn:

1. The variables of sex, presence or absence of brain-injury, time spent in school, and chronological age did not significantly affect test performance. However, intelligence (as measured) was a highly pertinent factor.
2. Posttraining and transfer performance were more sensitive measures of differences in ability than was pretraining performance.
3. The method used in this experiment appears to be a suitable procedure for studying educability in severely mentally retarded children.

Implications

The most important finding of this experiment is thought to be that learning and transfer performance reflected differences in ability which initial test performance failed to measure. This carries the implication that for severely mentally retarded children, and perhaps for others as well, tests which are administered only once may fail to measure abilities essential to educability.

The results also imply that the method used in this study is a basis for a test of educability for severely mentally retarded children. It is emphasized that this study was not an attempt to create such a test. It was merely a preliminary experiment in a method of testing. Reliability was not adequately determined. Definitive validation was not undertaken. The tests themselves require improvement. The subjects were drawn from a single urban area, the population was heterogeneous in terms of clinical types, and the sample was too small to be considered representative of the various groups as they occur in the population in general.

It is also recognized that a clear relationship was not definitely shown between the short-range learning gains which the tests measure, and the long-range learning gains at which education aims. Such a relationship is implied by the finding that learning and transfer performance correlated significantly with three external criteria which are not estimates of merely short-range behavior. However, actual validation studies are needed to supply a more direct answer to this question.

Despite the limitations of the present experiment, the results imply that a test based on this method would constitute a more direct, appropriate, and valid measure of educability for severely mentally retarded children. The method is direct in that it approaches educability through the measurable products of learning in process. Learning tests are the most direct way of investigating learning. The most direct procedure for studying a child's responses to instruction is to place him in learning situations, instruct him, and see what he does.

The procedure is appropriate because it is within the abilities of the subjects, permits objective discrimination among them, and minimizes the effects of their verbal, manipulative, and experiential lacks. The approach is logically valid in that it measures abilities on which education depends, in situations approximating those in which education takes place.

In planning for the severely mentally retarded child, an accurate picture of what the child can do is a paramount need.[1] It has been said that the ideal test for studying the mentally retarded would be one which investigated the ability to learn.[2] The method presented here appears to be a suitable procedure for studying the ability to learn in the severely mentally retarded child, and for using the results to help in obtaining a picture of what he can do.

With suitable refinements and the inclusion of additional areas, the method might provide the basis for a diagnostic profile of strengths and weaknesses in the learning ability of severely mentally retarded children. Areas requiring further investigation and perhaps the use of remedial techniques, as well as those on which training should concentrate, might thus be indicated.

The method might also be adapted for use with other children whose educability is difficult to evaluate by the usual procedures because of various types of sensory, manipulative, and verbal handicaps. Suitable tests might be devised for any group capable of perceiving the test items; of grasping pantomimic, tactual, or verbal instructions; and of making some sort of minimal, unambiguous response. Appropriate tests might be constructed for children from other cultural backgrounds, and for non-English-speaking groups. Finally, a measure of the outcomes of learning in process, with special emphasis on abilities crucial to education, might prove to be a valuable supplementary tool in evaluating educability in "normal" children.

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2. PENROSE, L. S., *Mental Defect*, New York: Farrar and Rinehart, 1934, p. 49.

REVIEW

Delp, Harold A. **The Delp IQ Computer.** Boston: Houghton Mifflin Co., 1950, $2.00.

The Delp IQ Computer is a 6" diameter, circular-type slide rule of unbreakable Vinylite. On one side of the computer are scales for computing Intelligence Quotients. On the reverse side are scales for computing months of Chronological Ages.

The IQ side offers a continuous circular computation of IQ's from mental ages and chronological ages. It has a special sub-scale for the corrections from 13 to 16 years when using the Revised Stanford-Binet Scale. This side is usable for all intelligence tests involving age scales, with the caution concerning the divisor for various "maturity ages", since the scale goes to 21 years. The scales can also be used for computation of any other quotients involving a test age and chronological age, e.g. with the Vineland Social Maturity Scale, reading tests, and the like. Error in computed IQ is less than one point which is considerably less than test errors.

The CA Computer on the opposite side is used to calculate the months of CA since the last birthday, from the birth date and the testing date.

Errors in computations such as these are frequent, and the Computer is a simple, mechanical method of obtaining the results. In addition, when using the Stanford-Binet, the scale relieves the examiner of needing the set of tables in the text, especially when the examiner prefers to use the short Guide.

In the classroom and school office it is often necessary to calculate the present mental age of each child when the IQ was obtained sometime previously. This is a laborious task of divisions in converting present age and IQ to present mental age. The IQ Computer offers a rapid and easy method of doing the computations as well as usually resulting in more accurate data, especially in cases where numbers of children are involved. The IQ Computer is also valuable in university classes in tests and measurements where teachers have a large quantity of tests to compute quotients and CA's.

Perception in Organic Mental Defectives: An Exploratory Study[1] I. The Size-Weight Illusion

NOEL JENKIN, Ph.D. and NOEL WEST

Some Considerations Upon Method

Intactness or adequacy of the special senses has always been a vital question for the psychologist concerned with mental retardation. Without unobstructed gateways to the mind, intellectual fulfillment must of necessity remain either beyond the child's reach or attainable only by prodigious efforts. This truism has of recent years been extended to encompass the possibility that not only the special senses, but also perception may be crippled in the retarded child. Largely in consequence of the work of Werner and Strauss, it is now recognized as a real possibility that a brain-damaged child may suffer from an impairment of the higher-level cerebral processes which organize and interpret the primary sensory information.

Recognizing the importance of this possibility, we embarked upon the present "exploratory" study, so called because it has limited objectives. Several considerations guided our planning, and these will be briefly discussed since they involve some issues of general interest concerning experimental method in the area of mental retardation.

First, we were by no means convinced that some reported differences in perception between organic and non-organic cases are genuine **perceptual** differences. That observed differences in behavior have occurred is not in doubt, but these may have issued from the differential response to similar experiences. This thorny problem has constantly arisen in the history of perceptual research. It is still with us today, as one of us has shown in a review of some recent literature (2). It was decided, therefore, that the initial study should be restricted to some rather simple perceptual tasks about which claims for distinguishing organicity had previously been made. Our aim was first of all to be sure that if differences were present, their origin could not be attributed to response mechanisms. Tasks which seemed conveniently to satisfy the criteria were constructed around the size-weight illusion and the Muller-Lyer illusion. A discussion of the former task is to follow, and a report upon the latter will be presented in a subsequent paper.

Second, it was found necessary to restrict the range of possible controls. One way of ensuring that our experimental results are properly attributable to organicity and to nothing else, is to employ a control group or groups. R. L. Solomon (7) has pointed out that the control group design is a concept which has developed somewhat slowly within the twentieth century, and which has still not attained optimum precision. In the fields of psychopathology, including mental retardation, this would seem especially true. A common practice has been either to use a single control group or no control group at all. We must recognize, however, that with many problems, a single control group is inadequate. No better example can be found than the present one, in which retarded brain-damaged children are to be studied. The minimum number of control groups for such a study should be two: (a) retarded but not brain-damaged; (b) normal. It is not difficult to see that ambiguity might still lie in the results of such an experiment when time of onset of brain-damage is considered. Brain-damage at or before birth might well have effects different from those of brain-damage which occurs after a few years of age. Control of this factor would require the introduction of two more groups.

Such a range of controls was thought to be unnecessary at the present exploratory stage of our investigation. In the present experiment, therefore, the groups were restricted to two. One of these consisted of mentally retarded individuals who were classed by medical opinion as definitely or probably brain-damaged. The other consisted of individuals who by their educational achievement showed no evidence of mental retardation. It was intended to test the significance of the difference between the two groups on the two tasks, and the significance of the within-group correlations of performances with intelligence. In the event of a positive finding, the relevant variables would then be embodied in a project with a more comprehensive design.

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The present experiment, therefore, goes one step beyond Doll's (1) study in which a large number of retarded children of unspecified etiology were tested for all-or-nothing presence of the size-weight illusion. Doll found that up to the age of 7 years there was a rectilinear relationship between the percentage of cases reporting the illusion and Binet mental age. Extension of this work with known organic cases and a normal group is a modest step forward, but one which seems to be necessary.

The third consideration which guided us was the need not merely for a gross measure of susceptibility to the illusions but for a group of measures reflecting certain stimulus variations. So that these could be studied in interaction with each other and with the experimental groups, we decided to use a complex analysis of variance design. Adapted to the present type of problem, this technique is both sensitive and versatile. Since it has been little used in research on mental retardation, the report to follow is intended as an illustration of its possibilities, as well as a material contribution. This statistical technique required quantification of the dependent variable in graded amounts. Instead of simply measuring presence or absence of the illusion, as in some previous work (e.g. Doll, 1; Koseleff, 3) it was decided to employ a matching technique as used in determining sensory difference thresholds. It would thus be possible to express subjective equality in terms of a physical measure.

The principal hypothesis to be tested was that brain-damaged cases would be less subject to the size-weight illusion than normal cases. Previous work has established only that a lessened susceptibility to the illusion is related to mental deficiency in general. Partly in consequence of suggestions contained in previous work (1, 5) and partly because there are no a priori grounds for supposing that the task has anything in common with an intelligence test, the present hypothesis specifies brain-damage as the related factor.

The second hypothesis concerned the "time error," which arises in consequence of the common tendency of subjects to judge the second of two equal weights as the heavier. From the "fading trace" theory (9, pp 439-448) it could be predicted that brain-damaged cases would be more subject to the time error than normal persons. This prediction makes the assumption that adequate retention of a memory trace is dependent upon normal cerebral integration.

Apparatus and Procedure

The apparatus for the size-weight experiment consisted of first, two standard cylinders, one measuring 2.4 in. diameter and the other 0.7 in. diameter. Each cylinder was 1.4 in. high, and each weighed 54 gm. Second, a comparison (variable) series of 20 weights was graduated from 5 gm. by steps of 5 gm. each to the heaviest 100 gm. weight. These were also cylinders, of 1.1 in. diameter and 1.3 in. height.

The task for the subject was to lift a standard weight and then lift one of the comparison cylinders. Each time he was required to give one of three judgments, "lighter," "equal," or "heavier," referring to the comparison cylinder. It was necessary for him to lift each pair of weights at a constant speed, as determined by a metronome, and to observe the weights as they were lifted.

The pairing of a standard weight with each member of the comparison series until the judgments have changed direction (e.g. from lighter to heavier) is called a series. On his first series with each standard, each subject began with the lightest (5 gm.) weight, and on the second he began with the heaviest (100 gm.) weight. In subsequent series he began from a point between four and seven steps away from his initial threshold. The exact location of this point was randomly distributed throughout the remaining series which were alternately of ascending and descending type. An average of about nine judgments per series was made by each subject. From each series there was secured an upper and lower threshold for the determination of equality, and the mean of these was scored as the point of subjective equality.

Half of the subjects in each main group (16 organic and 16 normal) first made a group of judgments of the small standard, and in a second session conducted on another day, made their judgments of the large standard. The other half had this order reversed. In order to measure the time error, the experiment was designed so that each subject judged each standard under two conditions: (a) comparison lifted first. (b) standard lifted first. This necessitated counterbalancing for the order in which these conditions were experienced. Therefore half of the subjects in each main group began the experiment with one of the standards presented first for each judgment, and the other half began with the comparison weights presented first.

In summary, there were four pairs of subgroups and two pairs of varied conditions. Since each subject made judgments from two ascending and two descending series under each condition, he made a total of 16 scores and the total number of scores from all subjects was 512. In the analysis, each subject's performance was reduced to a mean of his four scores for each experimental condition, giving a total of 128 degrees of freedom.

The organic group consisted of 16 students at The Training School who had been medically diagnosed as brain-damaged or probably brain-damaged. Their ages ranged from 12 to 26 with a mean of 19.7 years. The control group of 16 cases consisted of students from a nearby junior high school, plus some employees of The Training School. Ages in this group ranged from 11 to 30 with a mean of 20.7 years. An effort was made to match the chronological age of each organic case with that of each control case. With only three exceptions, there was not more than one year's difference between the ages of any such pair.

Results

Five experimental variables were included in the design, the definitions of which are as follows:

1. Groups: (a) Normal, (b) Organic.
2. Sizes: (c) Small standard, (d) Large standard.
3. Time error: (e) Standard lifted first, (f) Variable lifted first.
4. Order: (g) Small standard in Session I. (h) Large standard in Session I.
5. Sequence: (i) Standard lifted first in Session I. (j) Variable lifted first in Session I.

For statistical reasons it was desirable to limit as far as possible the number of variables treated in the analysis. Preliminary analyses established the fact that only one of the variables, i.e. "Sequence" did not contribute significant variance, either alone or in simple interaction with the other conditions. This left four main sources to be studied. A simplified breakdown showing the relationships between the mean weight matches under the four conditions is shown in Table 1.

Table 1
Mean weight matches (in grams) under four experimental conditions

	(a) Normal	(b) Organic	Grand Mean
(c) Small Standard	62.7	53.0	57.9
(d) Large Standard	31.9	36.1	34.0
(e) Standard lifted first	45.2	43.5	44.3
(f) Variable lifted first	49.4	45.6	47.5
(g) Small series first	46.9	47.9	47.4
(h) Large series first	47.7	41.3	44.5
Grand mean	47.3	44.6	

Table 2
Analysis of variance of weight matches

Source	d.f.	M.S.	F[1]
Groups	1	231	3.08
Order	1	266	3.55
Groups x Order	1	439	5.85*
Subjects	28	75	
Sizes	1	18234	314.38**
Time Error (TE)	1	320	5.52*
Size x TE	1	40	
Size x Groups	1	1542	26.59**
Size x Order	1	49	
TE x Groups	1	34	
TE x Order	1	7	
Size x TE x Groups	1	67	1.16
Size x Groups x Order	1	110	1.90
TE x Groups x Order	1	39	
Size x TE x Order	1	1	
Size x TE x Groups x Order	1	8	
Residual	84	59	

* $P \leq .05$
** $P \leq .001$
[1] F ratios lower than unity were not computed.

The significance of the differences between the two factors for each variable, also the significance of the effects of the different variables in combination is shown by the results of an analysis of variance, summarized in Table 2. Four positive conclusions are possible from these results.

First, as expected, the difference between sizes of standard was significant at an extremely high level of confidence. This means that the two standards, though actually weighing the same amount, were judged to be different by the subjects of the experiment. This is no new finding, but another demonstration of the compelling nature of the size-weight illusion, where a weight large in volume appears to be lighter than the same weight manifesting in a small volume.

Second, the interaction Size by Groups is significant at a high level of confidence. This confirms our main hypothesis, that normal persons respond to the two standards with a greater matching differential than do organic patients. As seen from Table 1 the organic group matched the large standard with a heavier weight and the

small standard with a lighter weight than did the normals. Hence the illusion, while present for the organic group, was considerably smaller in magnitude than for the normal group.

Third, the interaction Groups by Order was statistically significant. This unexpected result is of some interest. Examination of Table 1 shows that whether the small or large standard was dealt with first made little difference to the average weight match of the normal group. In the case of the organics, however, there was a heavier overall match when the small standard was judged in session 1 and a lighter match when the large standard was judged in session 1. A more detailed breakdown of the data than given in Table 1 shows that the effect of judging the large standard in session 1 was to enhance the illusion for the normal group and to diminish it for the organic group. This finding is important if the size-weight illusion is to be developed as a diagnostic device. A theoretical significance is also present. This lies in the evident persistence, in the organic group only, of a response tendency from an earlier situation (e.g. large standard) to a subsequent one (e.g. small standard). It appears that the large standard was judged "light," and that this "adaptation level" reflected itself in the subsequent situation where judgments became lighter than otherwise indicated by the available cues. The reverse applies to the sequence in which the small standard was followed by the large one. Here the large standard tended to be judged heavier than otherwise indicated, resulting in a larger overall weight match. The normal group on the other hand, showed what might be interpreted as a greater responsiveness to the perceptual cues in both situations, and more independent estimates of both standards.

Fourth, the "time error" variable was, as expected, statistically significant. As seen from Table 1, the standard when lifted first was judged lighter than when it was lifted second. Contrary to our hypothesis, however, there was no significant difference in this variable between normal and organic groups, as indicated by an F ratio lower than unity for the Groups by Time Error interaction.

Possibly the most important variable which the limitations of our design did not allow us directly to control is that of intelligence. As the results have been presented so far, it is possible to attribute the observed differences between groups either to intellectual deficit or to organic brain damage. In either case we have established the significance to mental retardation of the size-weight illusion, when measured in a fairly refined manner, and have distinguished what appear to be sensitive and economical procedures to use in further work. It would be useful, even at this stage, however, to examine the role of intelligence as a possible determinant of the results.

For this reason, we first obtained for every subject a single score representing the extent of the illusion. This was computed by the formula: sum of small standard judgments minus sum of large standard judgments. It is noteworthy that only one subject obtained a minus score, and this was an organic subject. Positive scores all indicated the illusion to be present.

For each group separately, the illusion scores were ranked and intercorrelated (by the Spearman rank-difference method) with chronological age. For the organic group, it was possible also to compute correlations with mental age and with I.Q. The results are shown in Table 3. The correlation of C.A. with extent of the illusion in the organic group just reaches significance at $P = .05$. This means that there was a tendency for the younger organic subjects to experience the illusion in lesser degree and for the older organic subjects to experience it in greater degree. This is not the case with the normal group, in which a similar dispersion of ages occurred. Nor is there any significant correlation with M.A. or I.Q. in the organic group. In view of this total pattern, we are inclined to think the positive correlation with organic C.A. to be spuriously high due to chance causes. Pending further work, our tentative conclusion is that there is no reason to suppose that the difference between organic and control groups is due to intellectual variation.

Table 3

Rank correlations with extent of illusion

Group	Measure	Rho
Normal	C.A.	.01
Organic	C.A.	.48*
Organic	M.A.	.12
Organic	I.Q.	.06

* $P < .05$

Discussion

Previous work, reviewed by Nyssen and Bourdon (6) and supplemented by them with additional data (5) has suggested that mentally retarded subjects are less subject to the size-weight illusion than are normal subjects. The present experiment has provided opportunity to evaluate this view with a test of statistical significance. The results give strong confirmation to the hypothesis. Further, the present results give good reason to suppose that diminished susceptibility to the size-weight illusion is due to brain-damage rather than to intellectual deficit. Also uncovered by the design of the present experiment is an interesting series effect which discriminates the organic group from the normal group.

At the present stage of the investigation, our results must remain principally an empirical contribution, possibly with some methodological interest. Even at this exploratory level, however, our results prompt a few reflections. First, we are faced with the apparent paradox given by our principal result, that brain-damaged persons in this situation perceive in a more accurate, veridical, reality-structured manner than do normal persons. The gross degree of error measured in our situation is not, however, an index of perceptual inefficiency; rather it is the opposite. The combining and synthesizing of several sources of information in a finished percept is characteristic of the highly functional value of a flexible and complex cognitive organization. If we were able to respond to stimulation only in strictly veridical terms, we would be severely limited in the extent to which past experience could enrich the percept. Also limited would be the extent to which a present background context of stimulation, often supplied from other sense modalities, could be evaluated and integrated with the event in the foreground.

At least four sources of information were available to a subject in the present experiment. Visual, tactual and kinesthetic sense data were present, as also a "set" or expectation based on previous experiences with large and small objects. There is no reason to believe that the first three of these sources of information were denied to our organic subjects, since cases of gross locomotor impairment or sensory deficit were excluded from our sample. Neither does it seem that inability to maintain a set is the explanation for their atypical performances. Indeed, as shown by the Groups by Order interaction, the organics were superior in maintaining a kind of set not unlike the one which presumably fosters the illusion. Rather we believe that their behavior is accounted for most probably by a partial failure of integration, an inadequate evaluation and synthesis of the available data. It may be supposed that attention was directed principally toward the kind of information most relevant to the task, namely, kinesthetic sensations from muscular exertion, following a preparatory adjustment. The other sources of information, principally the visual impression of size, were probably used by the organic cases to a lesser extent.

This analysis supports Tolman's (8) position in claiming that brain-damage is one of the conditions which can result in a "cognitive map" which is "narrow and striplike." Applied to the problems of mental retardation, this concept is suggestive of some useful approaches to better understanding.

Further work along the present lines could usefully be aimed at studying systematically the breadth of cue-utilization in brain-damaged children. Such work is in its preliminary stages at the Vineland laboratory. We also feel it important to study a range of perceptual tasks of different kinds, with a view to isolating the factors responsible for impaired integration of sensory and memorial data. The size-distance judging situation is one which offers opportunity for such a study, and this also is being currently investigated.

Summary

An experiment was conducted in which subjects were required to match the weight of two standard objects, identical in weight but different in volume. Five independent variables were included in the design, four of which were found to produce significant effects either separately or in interaction. The principal findings were (a) that cases classified as brain-damaged were considerably less susceptible to the size-weight illusion than normal persons; (b) that the brain-damaged cases more than normals were influenced in their judgments of a later series by their experience of an earlier series; (c) that the "time error" in lifting weights is present in approximately equal degree in both types of subjects studied. Implications of these results for theory and for further research were discussed.

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The 3 I's, NOT The 3 R's
A Philosophy for Teachers of Mentally Retarded

HAROLD A. DELP, Ph.D.

Traditionally, most emphasis in education has been pointed to the so-called 3 R's — reading, 'riting, and 'rithmetic. The fetish still prevails that the child who is taught these three fundamental subjects in adequate amounts will automatically be able to use them in solving the problems of adult life and, hence, will be a success. In teaching mentally retarded children the old philosophy usually was one of giving the same 3 R's to the children in slower doses and admitting that they would not reach the same higher level needed by the mentally normal, let alone the superior, children. Too many parents today still hold to the concept that the 3 R's are basic to all children, regardless of concommittant conditions.

An intermediate period in education of the mentally retarded proposed de-emphasis on the 3 R's on the basis that these children could not in most cases reach a usual level of performance. Hence, in many classes teaching proceeded on almost a hit-or-miss basis of teaching these children "to use their hands." Then, the evidence seemed to point to the fact that, for the retarded, emphasis on the use of their hands was in many ways no more justified than the more extreme emphasis on the 3 R's. The approach seemed to be that each individual child had to be studied in terms of his own abilities and special disabilities, with education having the responsibility of finding the most promising areas for training each child. Because of limitations on methods, materials, as well as techniques, the difficulties of teaching these retarded children seemed to be almost insurmountable.

To alter the past emphasis, the 3 R's would appear to be a point of view, rather than specific answers, to at least a big part of the teachers' problems in the education of mentally retarded children. The 3 I's — INITIATIVE, INGENUITY, and IMAGINATION — play a most prominent role in the teacher's approach. It is through these concepts that the teacher is able to make the most of the abilities of each child and to give him the most adequate proportions of the 3 R's, the hand and sense training, the social skills and attitudes, as well as the attitudes, work habits, and work skills which give the most promise of success in later adult life wherever the child may find himself, independent in the community, in a sheltered home environment, or, even for some children, in institutions.

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Initiative

"readiness and ability in initiating action; enterprise; leading to action." - - - The American College Dictionary, Random House.

At the current level of knowledge as well as the availability of materials, the teacher of the mentally retarded must have and use initiative at a very high level. Each child is different. No class of mentally retarded children has a group of so-called 'average' for whom most of the work can be pointed as is the case in a normal school graded class. The teacher is continually faced with new problems which require immediate handling, be they related to actual learning of the individuals in the more academic sense or to the actions and behavior of these children. With the 'trainable' level of children this characteristic becomes even more of a problem. Children with adolescent or adult bodies and, in many cases, similar or nearly similar social ideas have minds which allow comprehension at the level of a very small child. Conflicts are bound to arise, both in the teacher's mind as well as in the child's. The initiative to work out these problems is a necessary attribute.

Ingenuity

"the quality of showing cleverness of invention or construction; skillfulness of contrivance or design, as of things, actions, etc." - - - Dictionary.

Motivation is a difficulty in all classrooms but seems to be particularly so in classes for the mentally retarded. Children here have failed so often they frequently see no reason to try something new. The teacher's job is to develop materials, actions, and ideas which are related to the child's needs, in which **he** as an individual can see some relationships, and which can show a sense of achievement when the child has completed them. Brain-injured children show a rather extreme

variability of things they can and cannot do. The development of training activities here imposes an extreme requirement on the ingenuity of the teacher in her skill of contrivance of articles, materials, etc.

Imagination

"the action of forming mental images or concepts of what is not actually present to the senses; the powder of reproducing image stored in the memory under the suggestion of associated images or of recombining former experiences in the creation of new images different from any known by experience." - - - Dictionary.

"Each child is an individual." How often has this statement been made in education. But regardless of this point of view, educators still find much in common among a large share of any regular class of children. To the special class teacher, faced with a situation in which every child is literally an individual in most ways and exceptional ways at that, the day-to-day requirements never seem to repeat. Hence, a major philosophy and ability of teachers of the mentally retarded is that of "recombining former experiences in the creation of new images different from any known by experience." The primary individualities of the children force the teacher into a day-to-day, educated trial-and-error system of finding ways, means, and materials through which she can reach each child and so foster his development to the maximum of his potentials. A serious deficiency in the educational field is the lack of communication existing between teachers who perhaps have had an experience with a child which might be repeated some time and some where by another teacher with another child. A feeling for this problem by most teachers could easily reduce the number of literally different and new situations by more numerous interchanges of suggestions and ways in which problems have been met.

Team Approach

In helping the teacher use the 3 I's, an added attitude is the 'team approach.' This implies first the cooperation of several various disciplines in the diagnostic phase as well as in the area of prognosis and program planning. All too often the teacher has become accustomed to receiving merely an IQ and then expecting to base all teaching procedures on this score. A point of view even in terms of the psychological report is — Never accept a simple IQ score. A good psychological report will include such interpretations as the teacher should be able to use in the classroom in working with and teaching each individual child. For each child areas of strengths and weaknesses should be pointed out, together with probable areas of best learning. The interpretations should explain some of the behavior characteristics which will be assets or liabilities in class activities. Hence, the teacher or vocational worker has knowledge of possibilities for each child which are impossible to obtain from a simple score. It is also extremely important to know and remember that, of two children with identical IQ's, the scores probably have been received through quite different patterns of performances and so mean quite different things in terms of actual teaching. We MUST have good mental test scores. But we must also have considerably more of interpretation. A reason for some errors in this direction is the tendency of schools and special classes to record the IQ but 'hide' the complete report as being of little value. For special children a cummulative file should always include all complete reports and be located in such a way as to make them easily available to using personnel.

In addition to the complete use of psychological reports and insistence on receiving them, the school and teacher must expect to use more varied professional help in discovering the true facts concerning each child and in coordinating these facts for classroom use. No mechanical methods can be stated because of variations among school procedures. In many the psychologist is the responsible person in referring the child to other professionals. In some a medical officer is responsible. The teacher must be on the lookout for such added information as may allow for more understanding of the child's needs and abilities to supplement other knowledge of teaching procedures for the maximum growth of the individual. Quite often hearing or vision problems are added to a basic retardation, and so cause a modification of teaching methods. Knowledge of other physical problems, especially that of muscular coordination, add to the picture. Diagnosis which has been established through neurological or psychiatric assistance on the team clarifies many of the limits. Quite frequently a rather severe emotional disturbance is superimposed on the basic retardation, but must be taken into account in daily teaching. In other cases the disturbance appears to be organically related and so improvement is obtained by understanding the situation as well as attempting to develop better habit control wherever possible.

Brain Injured

For many years most of our concept of the mentally retarded was based on the assumption that this is primarily a problem of heredity. Evidence assures us that much of the problem is actually the result of damage to the brain cells before, at, or shortly after birth. Some data indicate that a very large majority of all births have some difficulties with development of the brain. In many of these the natural body processes dissipate the situation so that little, if any, actual permanent damage occurs to the cells. For those other cases where the body chemistry could not take care of the problem, or where the initial problem was too great, an actual brain damage results.

The peculiarities of the brain-injured individuals have been discussed in many current books and articles. But it is important for the teacher to have some idea of the facts and what they mean for the individual child. During a comprehensive psychological examination many of these children show extreme variations among the types of activities they can perform at an almost normal level compared to those for which they show an almost complete lack of ability. In some cases the professional reports will be able to define many of these situations. In others it remains for the teacher, having information that the child probably is brain injured, to use an educated trial-and-error to determine the variations in learning pattern for the particular child.

Without some of the above information and concepts, many teachers use either of two extremes in their work with the individual. First, they assume that 'every child must learn certain basic facts' and so proceed to pressure every child to learn them, without consideration of the individual's particular deficits. The other extreme is that, with information of the child's limitations in a certain area, the teacher makes no attempt to allow the opportunities for learning, simply on the assumption that he will never be able to learn it. An intermediate approach would appear to be more sound. If a teacher accepts professional knowledge of the child's lack in an area, she should reduce the pressure in that area, in spite of any preconceived attitude of uniform learning and needs. On the other hand, because some children apparently are able to learn much more in an area than tests would indicate possible, she should make a variety of opportunities and motivations available so that the child will have the chance to improve, if the proper stimulus can be found. The composite approach tends to reduce the emotional tensions usually resulting from pressure to produce beyond abilities and at the same time offers opportunities to learn for those cases where the ideal approach can be found.

Certain basic assumptions probably are well founded. It would seem unlikely that a child with an IQ of 40 would ever be able to learn to read a daily newspaper or a work manual with real understanding. On the other hand, many such individuals have been able to learn skills related to general reading so as to become much more self-sufficient and productive. It is not unusual for a child of IQ 40 to learn to 'read' the baseball scores, the weather forcasts, etc. with fair comprehension. But before we make too many assumptions for the individual child, the teacher should use good techniques and motivation to make materials available to verify the child's responses and results in the activity.

The time may come when prognosis of brain damage as to location, type, and implications will be technically more complete. As the fields of neurology, bio-chemistry, psychology, and others develop new techniques and procedures, the help to the teacher and others working directly with a brain-injured child will greatly increase. To this extent our results in the child's learning and development will improve.

Clinical Teaching

Perhaps an attitude which would help the teacher is the acceptance of her work as 'clinical teaching.' By this is implied a variety of methods, techniques, and approaches which at the extreme accept each child as a different individual. It has been said that, in regular public school, there is no such thing as a normal fifth grade class — if by this is meant that each child is capable of and is producing at fifth grade in each area of school learning. Within every such class there is a range of chronological ages, a wider range of mental ages, together with all the variations of individual abilities and interests. If more regular classroom teachers could get away from the feeling that they should be teaching the identical material at the same time to every student, much improvement in learning should be obtained. In the special class it might be said that every child is more or less an extreme when compared to the regular

classroom. At the same time these children are different from each other in many ways. The teacher must teach in such a way that she is able to develop a certain amount of group feeling and coordination and at the same time be able to consider all of the extreme individual differences present. One method long discussed in college classes on methods is the 'experience unit.' This allows a theme which is of interest to at least the majority of the class to hold the class unity. At the same time each child can be progressing at his own level and in the directions which offer the most opportunities for success and future educational development. It is here that the 3 I's enter completely into the everyday teaching practices.

Summary

Obviously, the 3 I's will not, in themselves, solve all of the problems of special class teachers. And what is described here for teachers of the mentally retarded is in many ways equally true for teachers of all special fields — the deaf, the crippled, the gifted, etc. Perhaps, however, the point of view will help some of those teachers who feel at a loss as to solving their daily problems of teaching the children under their care. A feeling of at least partial security can develop from the knowledge that there is no panacea, no 'canned' set of methods and materials, by which exceptional children can be taught. Rather that, by the very nature of their exceptional differences, the imposition is on the teacher to find the key for each individual child by which he can develop into a more happy, self-sufficient, and partially productive member of society in the future.

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INDEX

The Training School Bulletin
Volume 54
May 1957 — February 1958

INDEX OF SUBJECTS

Book Reviews
"Barbara: A Prologue"
Douglas S. Campbell — Feb. 58, No. 4
"One of Those"
Douglas S. Campbell — Feb. 58, No. 4
"Unsettled Children and Their Families"
Andrew T. Sember — Aug. 57, No. 2

Education
"Criteria for Vocational Training of the Mentally Retarded"
Harold A. Delp — Aug. 57, No. 2
"Study of Sheltered Workshops for the Mentally Retarded"
Bernard F. Niehm — Feb. 58, No. 4
"A Report on Community Care for the Mentally Retarded in Oldham, England"
Peter Stephens — Nov. 57, No. 3

In Memoriam
Dr. Henry Herbert Goddard — Nov. 57, No. 3

Psychology
"Diagnosing Child Behavior: An Experimental Approach"
Donald H. Bullock and Norma S. Wohl — May 57, No. 1
"Classification and Research in Mental Deficiency"
Mortimer Garrison, Jr. — May 57, No. 1
"Psychotherapy with The Mentally Retarded: A Case History"
Harvey L. Glass — Aug. 57, No. 2
"A Method for Measuring Educability in Severely Mentally Retarded Children"
Helen Schucman
Part I — Nov. 57, No. 3
Part II — Feb. 58, No. 4

Recreation
"A Note on Mixed Summer Camping with Retardates and Nonretardates"
Robert M. Allen — Nov. 57, No. 3
"A Critique of Summer Recreational and Crafts Activities for Mentally Retarded Children"
Andrew T. Sember — Nov. 57, No. 3

Speech and Hearing
"Experience with Conditioned GSR Audiometry in a Group of Mentally Deficient Individuals"
J. V. Irwin, J. E. Hind, and A. E. Aronson — Aug. 57, No. 2
"Testing the Hearing of the Mentally Retarded"
Bernard B. Schlanger and Robert H. Gottsleben — Aug. 57, No. 2
"Analysis of Speech Defects Among The Institutionalized Mentally Retarded"
Bernard B. Schlanger and Robert H. Gottsleben — May 57, No. 1
"Mentally Retarded and/or Aphasic"
Bernard B. Schlanger — Feb. 58, No. 4

INDEX

The Training School Bulletin
Volume 54
May 1957 — February 1958

INDEX OF AUTHORS

Allen, Robert M.
"A Note on Mixed Summer Camping with Retardates and Nonretardates" — Nov. 57, No. 3

Bullock, Donald H. and Wohl, Norma S.
"Diagnosing Child Behavior: An Experimental Approach" — May 57, No. 1

Campbell. Douglas S.
"In Memoriam, Dr. Henry Herbert Goddard" — Nov. 57, No. 3
Book Reviews:
"Barbara: A Prologue"
"One of Those" — Feb. 58, No. 4

Delp, Harold A.
"Criteria for Vocational Training of the Mentally Retarded" — Aug. 57. No. 2

Doll, Edgar A.
"To Study the Causes" — Nov. 57, No. 3

Garrison, Mortimer, Jr.
"Classification and Research in Mental Deficiency" — May 57, No. 1

Glass, Harvey L.
"Psychotherapy with The Mentally Retarded: A Case History" — Aug. 57, No. 2

Irwin, J. V., Hind, J. E., Aronson, A. E.
"Experience with Conditioned GSR Audiometry in A Group of Mentally Deficient Individuals" — Aug. 57, No. 2

Niehm, Bernard F.
"Study of Sheltered Workshops for the Mentally Retarded" — Feb. 58, No. 4

Schlanger, Bernard B.
"Mentally Retarded and/or Aphasic" — Feb. 58, No. 4

Schlanger, Bernard B. and Gottsleben, Robert H.
"Analysis of Speech Defects Among The Institutionalized Mentally Retarded" — May 57, No. 1
"Testing the Hearing of the Mentally Retarded" — Aug. 57, No. 2

Schucman, Helen
"A Method for Measuring Educability in Severely Mentally Retarded Children: A Primary Study" — Nov. 57, No. 3
"A Method for Measuring Educability in Severely Mentally Retarded Children: A Primary Study" Part II — Feb. 58, No. 4

Sember, Andrew T.
"A Critique of Summer Recreational and Crafts Activities for Mentally Retarded Children" — Nov. 57, No. 3

Book Review:
"Unsettled Children and Their Families" — Aug. 57, No. 2

Stephens, Peter
"Report on Community Care for the Mentally Retarded in Oldham, England" — Nov. 57, No. 3

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